Report on CDFA WMA contract #08-____
Discovery and Evaluation of Biological Control Agents of Russian Thistle and Scotch Thistle
14 February 2009
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Accomplishments:

Salsola (tumbleweed)

We continued monitoring 6 long-term study sites (Camp Roberts, Neenach, Eureka Valley, Bishop (LADWPA), Casa Diablo (BLM), Kern Co. Water Agency), where we collected data on abundance, size and identification of *Salsola* species. Baseline data and sampling techniques will facilitate future impact studies after the mite *Aceria salsolae* is permitted for release. USDA-APHIS has been processing our application for a release permit for the mite Aceria salsolae.

We conducted some additional larval transfer experiments with *Gymnancyla canella* (stem- and seed-boring moth from France) in the USDA-ARS Albany quarantine laboratory which are ongoing. We are planning to conduct a field experiment in summer 2009 in Italy to confirm specificity and impact on *Salsola tragus*.

BBCA provided specimens of a new species of *Gymnancyla* collected on *Salsola kali* in Northern Sicily (different from *G. canella*) to Alberto Zilli, an Italian Lepidoptera taxonomist, for description. This moth has been collected at four sites in Sicily. Larvae of a similar moth were collected on *Salsola tragus* in Slovakia which was very damaging. *ADD PHOTO *WAS BBCA ABLE TO REAR ADULTS FOR ID?

BBCA collected 18 adults of the stem-boring weevil *Lixus rosenscoeldi* in June in Sicily. They proved to be in reproductive diapause so they have been held in an incubator to complete hibernation.

BBCA collected 30 adults of the stem-boring weevil *Lixus canescens* in central Turkey in June. Two-way choice oviposition experiments were conducted by BBCA using S. tragus, S. soda, *Bassia hyssopifolia*, *Kochia scoparia*, and *Suaeda californica*. Adults oviposited in only 6 of 38 trials and 2 of 11 eggs were oviposited in nontarget plants. However, the low oviposition rate suggests that the adults were at the end of their reproductive cycle.

The weevil genus *Cosmobaris* is under taxonomic revision, and it is possible that there may be host-specific cryptic species. This species is known to damage stems of *Salsola*, but is also known as a pest of beets. *Cosmobaris* larvae were collected in California on *Chenopodium album* and were sent to M-C. Bon (USDA-ARS-EBCL) for DNA analysis to compare to *Cosmobaris* collected from *Salsola* in Europe. BBCA collected *Cosmobaris scolopacea* on *Salsola kali* in Sicily for similar analysis. In Albany, larva are being held on artificial diet to complete winter diapause to produce adults for morphological analysis by Jens Prena (USDA-ARS-SEL).

Scotch thistle

Larinus planus, a weevil that damages flower heads of Scotch thistle were collected by BBCA in Turkey and sent to Albany. We initiated host choice oviposition experiments in quarantine and observed some adult feeding and oviposition on a few nontarget plants, but not larval development. It was difficult to obtain test plants as large as field plants that are flowering at the same time, and our cages may be too small for such a large insect, so we are working to improve our methods. We think that field testing will be crucial for obtaining adequate host-specificity data. BBCA is organizing a field garden experiment with a new cooperator in

central Turkey. Test plants will be planted in 2009 and maintained for an experiment to be conducted in 2010.

Trichosirocalus horridus sensu lato, a weevil that damages rosettes of musk thistle and Scotch thistle, may consist of host-specific species or biotypes. Several taxonomists question the validity of a recently published description of 3 species (*T. horridus*, *T. briesei* and *T. mortadelo*). We are cooperating with a team to compare the morphology (E. Colonnelli), DNA (M-C. Bon) and host plant specificity (Albany & BBCA) of populations collected on different host plants. In Albany, we have completed diapause development of insects sent from Spain and Oregon and are currently conducting choice oviposition tests.

We conducted additional choice adult feeding and oviposition experiments with populations of *Psylliodes chalcomera*, a flea beetle that has been collected on Scotch thistle, musk thistle and yellow starthistle. The results indicate clear differences in host plant preference of these three populations. Additional DNA analysis is being conducted by A. DeBiase to measure genetic separation among these populations.

Publications submitted:

Antonini G., Coletti G., Serrani L., Tronci C., Cristofaro M. & Smith L. Molecular analyses of the weevil *Ceratapion basicorne* (Coleoptera, Apionidae): a promising natural enemy of *Centaurea solstitialis* (Asteraceae). Biological Control. (submitted)

Papers published:

Smith, L., E. De Lillo, A. Stoeva, M. Cristofaro and B. Rector. 2008. Challenges to evaluation of eriophyid mites for biological control of invasive plants. In M. Bertrand, S. Kreiter, K.D. McCoy, A. Migeon, M. Navajas, M. S. Tixier, L. Vial (Eds.), Integrative Acarology. Proceedings of the 6th European Congress, European Association of Acarologists, Montpellier France, 21-25 July, 2008.

Smith, L. 2008 Biological control of Russian thistle (tumbleweed). Proceedings of the 60th Conference of the California Weed Science Society. pp. 90-93.
California Weed Science Society Meeting, Monterey, CA, Jan. 28-30, 2008. ARIS log # 223317.

Smith, L., M. Cristofaro, E. de Lillo, R. Monfreda and A. Paolini. 2009. Field assessment of host plant specificity and potential effectiveness of a prospective biological control agent, *Aceria salsolae*, of Russian thistle, *Salsola tragus*. Biological Control 48: 237-243.